setting forth, as they do, characterizations of the several genera and species to which the author has given his attention.

R. W. SHUFELDT.

Takoma, D. C., Aug. 15.

The Color of the Blood in Man.

HAVING recently examined a large number of specimens of human blood from persons of different ages ranging from four to seventy-six years, some being those in robust health, others being tuberculous, I was struck with the great difference in the shade of color presented, some being of a very rich tint, others very pale. The richest color was in the blood of a girl twenty-six years of age, a graduate of Vassar College, who had the highest anthropometric measurement for respiratory capacity in a class of about 500 girls. Her health was excellent, and she consumed rather more flesh-food than is usual. The next highest tint was found in the blood of a woman about seventy years old, with a somewhat unusual chest measurement, having also excellent respiratory capacity and being in fine health. This woman, on the contrary, does not eat flesh at all. I expected in her case to find a more than ordinary number of white blood corpuscles; but there were far less than usual, it being difficult to find them, they were so few. The palest blood was from a chlorotic Irish servant-girl of twenty-five years, and in a tuberculous boy of four. There was not much perceptible difference in their cases. The girl had naturally good respiratory power, but she had lessened it by tight clothing and an almost constant in-door life for a long time. After spending a month at the seaside, I examined her blood again, and found the tint somewhat deeper than before. As we know, the color of the blood is caused by the hæmoglobin in the red blood corpuscles, and if this is greater when the respiratory capacity is greatest, may not the color of the blood be heightened by enlarging the chest and increasing the lung-power? From some observations I have made I believe it can.

M. L. HOLBROOK.

New York, Aug. 16.

Snake Eats Snake.

WHILE walking over a dry mesa, yesterday, I noticed a small snake slowly crawling to the shelter of a mesquit bush. On capturing it, I found it to be of a very dark olive-green color, in large, square pattern, the lines between the plaids being of lighter green; underneath, white, with very dark-green blotches. Its head was very dark green, and rather small; it had small fangs. The length of the snake was nineteen inches. Noticing that the body seemed much distended, I opened it, and found, nicely packed away inside, the body of an ordinary, brown, striped "grass snake," as we call them here, twenty-two inches long. This green snake may be a new species of snake-eating serpent. The grass snake is very swift, and I am puzzled to know how the green snake caught it; it was swallowed head-first.

C. W. KEMPTON.

Oro Blanco, Arizona, Aug. 8.

Cleistogamy in the Pansy.

MR. DARWIN, in "Forms of Flowers," notes that, though cleistogamy is the rule in the genus *Viola*, the pansy, *Viola tricolor*, has not been known to exhibit it, though it does sometimes produce very small and closed self-fertilizing flowers, which would critically be termed cleistogamic if some portions of the floral organs were to abort. In our country this condition may more readily occur than in the Old World. In many localities the pansy has become partially wild and cleistogamy may be looked for. Mr. Chalkley Palmer has sent me some specimens in fruit, found wild in some place in New Jersey, which are certainly in one or the other condition noted by Mr. Darwin. They appear to be truly cleistogamic, but were too far advanced to determine with accuracy.

THOMAS MEEHAN.

Germantown, Pa.

BOOK-REVIEWS.

Annual Report of the Geological Survey of Arkansas for 1890. Vol. III. *Whetstones and the Novaculites of Arkansas.* By L. S. GRISWOLD. Little Rock, Arkansas.

THE history of the rise and progress of geology in the United States remains to be written. It dates back to early in the century; for in 1807 McClure published a paper containing geological observations. Mitchell, Eaton, Dewey, Silliman, and hosts of others followed one another in rapid succession. Nor were the observations of private individuals all that appeared in the early decades, for in 1823 Olmsted published a report on the geology of North Carolina, as one result of a regularly organized State survey, while Hitchcock in 1831 reported upon the geology of Massachusetts. Between that date and 1840 State surveys had been organized and reports had been published in Maine, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, Georgia, Tennessee, Kentucky, Ohio, Indiana, and Michigan. The general government, too, had sent expeditions to the north-west, Schoolcraft reporting upon the Michigan region as early as 1820. It is true that many of the State surveys ceased after the issuance of a few documents, but their existence even for a brief period was evidence of the belief in their value. Some of the States organized second surveys at a later date and published numerous volumes, among which New Jersey, Pennsylvania, Ohio, and Kentucky are especially to be noted. The survey of New York has been continued from 1837 until the present time.

In those olden times the State survey reports were general; observations were made over an extended area; profuse details were given of township or county geology; but no one subject was treated in an exhaustive manner. The result was that, when ten or a dozen or more volumes had been published, it still remained to collate and epitomize the information. For the States of New York, Pennsylvania,[1] Kentucky, Ohio, Illinois and others this has never been done, and the numerous volumes of these surveys are masses of details with full and comprehensive accounts of scarcely a single subject. Dr. Branner, as the State Geologist of Arkansas, has seen fit to change this ancient order of things, and as a result in his annual reports we have volumes describing the Mesozoic geology, the gold and silver fields, and the coal of the State, as well as exhaustive volumes on Manganese and the Novaculites. The first geological survey of Arkansas published two reports, in 1859 and 1860. The beginning of the war put a stop to the work, however, and it was not until 1888 that any further work in the State was published. The report for that year, and those for 1889 and 1890, of which the volume under review is the third, contain much information valuable alike to the State and to the world at large.

Whetting, or sharpening, is one of the ancient arts. That it was practised by early civilized man is evidenced by the existence in the Sanscrit of the word *ça*, meaning to sharpen or whet. From this comes the Latin *cos*, a whetstone, hone or flint-stone, and hence *cotaria*, a whetstone quarry. *Coticula*, meaning a small touch-stone, is also a derivative, and from this comes the French *coticule*, meaning a whetstone of a fine quality. *Novaculite* comes from *novacula*, a sharp knife or razor, and this in turn is derived from the Latin *novare*, to renew or to make fresh.

Many writers from Pliny down discuss whetstones or hones for sharpening tools. Linnæus used the word *novacula* in his time, and it was seemingly anglicized by Richard Kirwan into *novaculite* in 1784. Mr. Griswold believes, although all mineralogists do not agree with him,[2] that it is practicable "to revive the word as a scientific term, in its original sense, to denote a fine-grained, gritty, homogeneous, and highly siliceous rock, translucent on thin edges, and having a conchoidal or sub-conchoidal fracture. If this definition is strictly adhered to, no confusion will arise from the use of the word in commerce" (p. 18).

The knowledge of whetstones in America dates from 1818, when they were mentioned by Bringier as occurring in Arkansas.

[1] Professor J. L. Lesley is now engaged on this work, and Vol. I. of his final report has appeared.

[2] For example, G. P. Merrill in Annual Report U. S. Nat. Mus. for 1890, 1892. p. 525.

Since then they have been found in many parts of the country, no less than 106 localities being now known whence they have been obtained. All of these localities are naturally not equally good, and many of them are not now worked at all.

Some useful hints are given by Mr. Griswold in Chapter iv. on the purchase and care of whetstones, and especially that little-understood matter, the use of lubricants; and in Chapter v. the subject of manufacture of stones is discussed. This dates back to the beginning of the Christian era at least, for definitely-shaped hones are found at Pompeii. At present, in America, the stones mostly come from Indiana, Arkansas, New Hampshire, and Vermont; although there are other States producing them. The total out-put is small, and $75,000 would represent the value of the manufactured product in 1880.

Of the Arkansas stone proper, considered a typical novaculite, only about 60,000 pounds are quarried annually. The most of this goes to New York to be manufactured, whence it is largely shipped back to Arkansas. The blocks are laid in plaster of Paris in the bed of the gang-saw, and the saws are so arranged as to waste as little as possible. The sawing is slow, "saws going at the rate of 80 swings per minute will only penetrate the stone in the gang-bed at the rate of 1½ inches in 10 hours. Marble is sometimes sawed at a rate of nearly 8 inches per hour, though for dense marble 2 inches per hour is a closer estimate." After the first cutting the slabs are sorted, and the useless pieces thrown away, this being done again and again as the pieces are reduced in size until only 25 per cent of the original amount remains as a marketable product. Of the Ouachita stone, a coarser variety of whetstone, a much larger amount is produced, this being in 1889 1,040,000 pounds. The method of cutting is about the same as for the Arkansas stone, while the waste is about 50 per cent.

Mr. Griswold deals extensively with the petrography of the novaculites, giving descriptions of numerous microscopic sections from various localities. The conclusions may be summed up as follows: Novaculite rocks were deposited in deep water as sediments, the carbonate of lime crystallizing as rhombohedrons. Consolidation of the siliceous portions produced a hard, brittle rock, which, being subsequently folded and elevated above the sea-level, was subjected to erosion. During this process the calcite crystals were removed, and subsequently a secondary deposit of silica took place.

In regard to the sedimentary origin of the rocks, Mr. Griswold says:—

"It may be somewhat difficult to conceive of a constant supply of very fine fragmental silica, almost totally without other materials, in sufficient quantity to form beds several feet in thickness with very thin layers of slate between, and making a formation from 500 to 600 feet in thickness, yet this seems to have been the manner in which these rocks were formed. After all, the conception is not so difficult when one considers that the fragmental silica of many of the slates and shales is as fine as that of novaculite, and as the percentage of silica in the sediments forming these rocks is increased, the resulting rock approaches more and more closely the novaculite. Thus with the novaculites are associated very argillaceous shales, grading into siliceous shales and then into transparent novaculites. The almost absolute purity of the novaculites still causes doubt as to the possibility of this mode of origin; but many coarse sandstones are nearly as pure, and if the novaculites can be considered as extensions of the sandstones toward the deep sea, where the finer fragments would settle, then we have at least a close approximation to the sediments forming the novaculites. That the same action which produces the angular fragments of quartz in sandstones must also afford a very large amount of exceedingly fine quartz is evident" (p. 192).

Many pages of the report are devoted to details of the geology of the novaculite area, but it is obviously impossible to enter into any of these here. A brief epitome only can be given of the geological history of the area, which in Mr. Griswold's words is as follows:—

"The sequence of events in this history seems to have been as follows: A deposition of very fine fragmental material on the deep-sea floor to form the Silurian strata, included in the upper part of which are two groups where graptolites abound. At the end of the Lower Silurian deposition, through the periods known as Upper Silurian and Devonian, there was an almost total cessation of the deposition of sediments. There seem to be two possible explanations for this fact: First, there may have been a depression of the sea-bottom which left this area so far from shore that no thick sediments were accumulated over it, and this was followed by an elevation in Lower Carboniferous times renewing sedimentation in perfectly conformable beds; the second explanation is that while upper Silurian and Devonian beds were being deposited elsewhere, the same period was occupied by a deposition in the Arkansas area characterized by Lower Silurian organisms. This continued until a decided change of conditions in Lower Carboniferous times renders necessary a change in the nomenclature of the beds in consequence of the change in the character of the fossils.

"True Coal-Measure strata covered the novaculite area also, for they are found in Texas in a latitude considerably south of 34° 30′, while the trend of the formation is nearly east and west through this part of Arkansas and through the Indian Territory. The south members of the coal strata of northern Arkansas have been worn completely away, and are now buried beneath the Cretaceous and Tertiary deposits which cover southern Arkansas.

"Following the formation of the Coal Measures, and probably synchronous with the Appalachian uplift, came the elevation of Arkansas above sea-level. The time following this post-Carboniferous elevation of Arkansas has been one of erosion, though we have evidence of some periods of accumulation as well as denudation. The three periods of accumulation were the Cretaceous, Tertiary, and Pleistocene, during which there were partial and perhaps complete submergences of the area" (pp. 206–207).

The final chapter of the volume deals with the fossils of the area. These, it is true, are few in number, but seem to be sufficient to justify the assertion of the Lower Silurian age of the deposit. Dr. R. R. Gurley contributes some remarks upon the graptolites found in shales both underlying and overlying the novaculites. His conclusion is that two horizons are represented, one of Calciferous, the other of Trenton age. Comparisons are drawn between the Arkansas beds and those of Point Levis in Canada, Calciferous in age, and those of Norman's Kill in New York, of Trenton age. A number of new species or varieties are described by Dr. Gurley.

JOSEPH F. JAMES.

Washington, Aug. 11.

Outlines of Theoretical Chemistry. By LOTHAR MEYER. New York, Longmans, Green, & Co.

THE author of this volume is well known by the successive editions of his "Modern Theories of Chemistry" and by the share that he took in developing the periodic law of the elements. The larger work was translated some years ago by Professors Bedson and Williams; and the same translators have put this volume into good, readable English.

The author says (in view of the various works already published on theoretical chemistry): "I have not considered the requirements of students alone, but have been desirous of offering something to those friends of scientific investigation who have neither the intention nor the time to concern themselves with the details of chemical investigation, but wish to become acquainted with the general conclusions arrived at. With this object in view, I have abstained from too large a use of the numerical results of observations and measurements, and have avoided giving detailed descriptions of experimental methods. . . . The general — I may say the philosophical — review of the subject has been my chief aim, to which the details should be subordinated."

The author's purpose, as thus expressed, has been in good measure carried out. Chemists will prefer his "Modern Theories of Chemistry," if they would become really proficient in this aspect of the science; and to such this work may seem superfluous. But many, who are chiefly interested for practical reasons in chemical analysis or manufactures, may be glad to find so good an "Outline," compressed into 216 clearly-printed pages. The work is not made up of distinct chapters, but the sections seem to succeed each other in natural order, giving some prominence to the following topics: Atomic theory, the several methods of determining